0.a. Goal

Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all

0.b. Target

Target 7.3: By 2030, double the global rate of improvement in energy efficiency

0.c. Indicator

Indicator 7.3.1: Energy intensity measured in terms of primary energy and GDP

0.e. Metadata update

15 February 2021

0.g. International organisations(s) responsible for global monitoring

International Energy Agency (IEA)

United Nations Statistics Division (UNSD)

1.a. Organisation

International Energy Agency (IEA)

United Nations Statistics Division (UNSD)

2.a. Definition and concepts

Definition:

Energy intensity is defined as the energy supplied to the economy per unit value of economic output.

Concepts:

Total energy supply, as defined by the International Recommendations for Energy Statistics (IRES), is made up of production plus net imports minus international marine and aviation bunkers plus-stock changes. Gross Domestic Product (GDP) is the measure of economic output. For international comparison purposes, GDP is measured in constant terms at purchasing power parity.

2.b. Unit of measure

The energy intensity level of primary energy is expressed in megajoules of total energy supply per unit of purchasing power parity GDP in constant 2017 USD figures.

2.c. Classifications

The “International Recommendations for Energy Statistics” (IRES), adopted by the UN Statistical Commission, is the globally recognized standard used to develop the energy statistics underlying the calculation of the indicator.

This standard is available at: unstats.un.org/unsd/energystats/methodology/ires.

3.a. Data sources

Total energy supply is typically calculated in the making of energy balances. Energy balances are compiled based on data collected for around 150 economies from the International Energy Agency (IEA) and for all countries in the world from the United Nations Statistics Division (UNSD).

GDP data are taken mainly from the World Bank – World Development Indicator database.

3.b. Data collection method

The IEA collects energy data at the national level according to harmonised international definitions and questionnaires, as described in the UN International Recommendations for Energy Statistics available at : (unstats.un.org/unsd/energystats/methodology/ires).

UNSD also collects energy statistics from countries according to the same harmonised methodology.

The most recent GDP estimates published by the World Bank with reference year of 2017 have been used when calculating this indicator. Additionally, missing years for countries with at least one data point for GDP reported by the World Bank have been estimated using National Accounts – Analysis of Main Aggregates (AMA) growth rates.

3.c. Data collection calendar

Data are collected on an annual basis.

3.d. Data release calendar

The IEA World Energy Balances are published in February, April and July with progressively broader geographical coverage (publishing full information for two calendar years prior and selected information for one year prior). The UN Energy Balances are made available towards the end of the calendar year with full geographical coverage (publishing information for two calendar years prior).

3.e. Data providers

National administrations, as described in documentation on sources for IEA and UNSD:

wds.iea.org/wds/pdf/WORLDBAL_Documentation.pdf

unstats.un.org/unsd/energystats/data/

3.f. Data compilers

The International Energy Agency (IEA) and the United Nations Statistics Division (UNSD)

The IEA and UNSD are the primary compilers of energy statistics from across countries and develop internationally comparable energy balances based on internationally agreed methodologies. Aggregates are based on a merging between IEA and UNSD data.

3.g. Institutional mandate

IEA as one of the custodian agencies responsible for monitoring progress towards the SDG 7.3 target, leverage on their national data efforts and add value by promoting coherent standards, definitions and methodologies for both raw data and the derived indicators with the ultimate goal of producing international comparable datasets.

The UNSD mission in the area of energy statistics is to strengthen national statistical systems in order to assist them in producing high quality energy statistics and balances. The mission is realized through four workstreams: Data collection (since 1950); Development of methodological guidelines and standards in energy statistics (e.g., IRES, ESCM); Capacity building (to disseminate such methodology and to assist countries to strengthen their energy statistical systems); and International cooperation and coordination. UNSD was selected as one of the custodians of indicator 7.3.1 because it collects for all countries the underlying data necessary to calculate the denominator of this indicator.

4.a. Rationale

Energy intensity is an indication of how much energy is used to produce one unit of economic output. It is an inverse proxy of the efficiency with which an economy is able to use energy to produce economic output. A lower ratio indicates that less energy is used to produce one unit of output, so decreasing trends indicate progress.

4.b. Comment and limitations

Energy intensity is only an imperfect proxy for energy efficiency. It can be affected by a number of factors, such as climate, structure of the economy, nature of economic activities etc. that are not necessarily linked to pure efficiency. For better assessment of energy efficiency progress, more disaggregated data are needed, such as those at the sectoral and end-use level.

4.c. Method of computation

This indicator is based on the development of comprehensive energy statistics across supply and demand for all energy sources – statistics used to produce the energy balance. Internationally agreed methodologies for energy statistics are described in the “International Recommendations for Energy

Statistics" (IRES), adopted by the UN Statistical Commission, available at: unstats.un.org/unsd/energystats/methodology/ires/.

Once the energy balance is developed, the indicator can be obtained by dividing total energy supply over GDP.

4.d. Validation

The IEA has several internal procedures in place for energy data validation. This includes energy balance checks, time series analysis and reconciling differences in statistical classifications and definitions.

UNSD also has a number of internal validation procedures to ensure internal data consistency, for instance through energy balance checks, and trend consistency, e.g. by way of time series analysis.

4.e. Adjustments

The country specific commodity balances underlying the IEA energy data are based on national energy data of heterogeneous nature converted and adapted to fit the IEA format and methodology. Considerable effort has been made to ensure that the data adhere to the IEA definitions based on the guidelines provided by IRES. Nevertheless, energy statistics at the national level are often collected using criteria and definitions which differ, sometimes considerably, from those of international organisations. This is especially true for non-OECD countries, which are submitting data to the IEA on a voluntary basis. The IEA has identified most of these differences and, where possible, adjusted the data to meet international definitions. For details on recognized country specific anomalies and the corresponding adjustments, please refer to country specific notes included in the IEA World energy balances documentation file available at: wds.iea.org/wds/pdf/WORLDBAL_Documentation.pdf

Likewise, UNSD also needs to adjust certain data to fit the international methodology set by IRES, thus ensuring data comparability across countries. Data from all countries are submitted voluntarily to UNSD, sometimes via non-standard formats or through sharing of national publications. The identification of such deviations from the standard is an ongoing task, and UNSD has started publishing some of this information in a supplement to the Energy Statistics Database named "Notes on sources", available at: unstats.un.org/unsd/energystats/pubs/yearbook/, with the goal of increasing transparency and providing more and more information with time.

4.f. Treatment of missing values (i) at country level and (ii) at regional level

• At country level

The IEA has attempted to provide all the elements of energy balances, for over 150 countries. Providing all the elements of energy supply, has often required estimations. Estimations have been generally made after consultation with national statistical offices, energy companies, utilities and national energy experts.

Likewise, UNSD attempts to provide full energy balances for the 225 countries and areas it covers, including the 75 or so it covers for SDG reporting. This may require searching for national official publications, data from other international organizations and expert estimation based on reputable sources and other publicly available information. Generally speaking, data on the supply side is more widely available than transformation activities and final consumption.

• At regional and global levels

In addition to estimates at a country level, adjustments addressing differences in definitions alongside estimations for informal and/or confidential trade, production or stock changes of energy products are sometimes required to complete major aggregates, when key statistics are missing. Such estimations and adjustments implemented by IEA have been generally made after consultation with national statistical offices, energy companies, utilities and national energy experts.

4.g. Regional aggregations

Aggregates are calculated, whether by region or globally, by summing both total energy supply and gross domestic products over the group of relevant countries.

4.h. Methods and guidance available to countries for the compilation of the data at the national level

The IEA data corresponding to OECD countries are derived based on information provided in the five fuel specific annual OECD questionnaires completed by the national administrations. These questionnaires are available online at: iea.org/areas-of-work/data-and-statistics/questionnaires

The IEA commodity balances for all other countries are based on national energy data of heterogeneous nature, converted and adapted to fit the IEA format and methodology based on IRES recommendations.

In addition to IRES, UNSD has published the *Energy Statistics Compilers Manual* (ESCM - unstats.un.org/unsd/energystats/methodology/escm/) as a practical companion to assist countries in the compilation of data according to the international methodology. UNSD sends countries its own questionnaire (unstats.un.org/unsd/energystats/questionnaire/), except to the countries which are mandated to submit the IEA/Eurostat joint questionnaires. In the latter case, UNSD obtains data from the IEA.

4.i. Quality management

The IEA, in co-operation with the Statistical Office of the European Communities (Eurostat), has published an Energy Statistics Manual. This Manual helps the energy statisticians have a better grasp of definitions, units and methodologies. Moreover, IEA has established a quality management framework based on the internationally recognized guidelines recommended by IRES to ensure quality of statistical products.

ESCM contains a full chapter on the Generic Statistical Business Process Model applied to energy statistics, helping countries manage energy data quality. Inside UNSD, processes are established to ensure the quality of its products, and such processes are reviewed periodically.

4.j. Quality assurance

The IEA follows the guidelines recommended by the IRES to ensure relevance, accuracy and reliability, timeliness and punctuality, accessibility and clarity as well as coherence and comparability of the data.

UNSD coordinated input from international organizations and countries to publish IRES and its practical companion the ESCM. Each of both contains a chapter on quality assurance and metadata to help guide all countries ensure good energy data quality.

5. Data availability and disaggregation

Data availability:

IEA and UN Energy Balances combined provide total energy supply data for all countries on an annual basis. GDP data are available for most countries on an annual basis.

Time series:

2000 – present

Disaggregation:

Disaggregation of energy intensity, e.g. by final consumption sectors or end-uses, could provide further insights into progress towards energy efficiency. At present it is only feasible to calculate such sector disaggregation for the following sectors – industry, residential, transport, agriculture, households – as reported in the Tracking SDG7: The Energy Progress Report (formerly Sustainable Energy for All Global Tracking Framework). It would be desirable, over time, to develop more refined sectoral level energy intensity indicators that make it possible to look at energy intensity by industry (e.g. cement, steel) or by type of vehicle (e.g. cars, trucks), for example. Doing so will not be possible without further statistical data collection, also including collaboration with relevant institutions and energy consumers. Full methodological explanations are provided in the IEA *Energy Efficiency Indicators: Fundamentals on Statistics* manual available at: iea.org/reports/energy-efficiency-indicators-fundamentals-on-statistics

Decomposition analysis of energy intensity trends seeks to filter out factors that affect energy demand, such as economy wide scale and structure shifts, from more narrowly defined energy intensity shifts. This analysis is also reported in the *Tracking SDG7: The Energy Progress Report* or in the *IEA Energy Efficiency Indicators Highlights* available at: iea.org/reports/energy-efficiency-indicators

6. Comparability/deviation from international standards

Sources of discrepancies:

The IEA World energy balances and the UN Energy Statistics Database, which provide the underlying data for calculating this indicator, are global databases obtained following harmonised definitions and comparable methodologies across countries. However, they do not represent an official source for national submissions of the indicator 7.3.1 on energy efficiency. Due to possible deviations from IRES in national methodologies, national indicators may differ from the internationally comparable ones.

Difference may arise due to different sources of official energy data, dissimilarities in the underlying methodologies, adjustments and estimations.

7. References and Documentation

URL:

www.iea.org/; unstats.un.org/unsd/energystats

References:

IEA Energy Balances and Statistics

http://www.iea.org/statistics/

UN Energy Statistics Database

unstats.un.org/unsd/energystats/data (description) and data.un.org/Explorer.aspx?d=EDATA

IEA SDG 7 webpage: iea.org/reports/sdg7-data-and-projections

IEA Energy Efficiency Indicators Highlights

iea.org/reports/energy-efficiency-indicators

IEA *Energy Efficiency Indicators: Fundamentals on Statistics* manual

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